

WHAT IS CLAIMED IS:

1. A method for determining a proper transfer bias for each one of a plurality of colors, wherein said proper transfer bias is applied to a primary transfer member which enables transfer of said color images from a photoconductive drum so as to generate full-color images, the method comprising:

providing a photoconductive drum having an image region and a nonimage region;

determining a plurality of nonimage potentials for the nonimage region, wherein each nonimage potential corresponds to a respective one of the plurality of colors;

for said first color, determining a proper transfer bias voltage by,

applying a first nonimage potential corresponding to the first color to the photoconductive drum,

applying at least two predetermined voltages to the primary transfer member,

obtaining at least two currents corresponding to said two predetermined voltages during rotation of said primary transfer member, and

using the two currents and predetermined voltages to determine the proper transfer bias voltage for the first color; and

for all subsequent colors, determining a proper transfer bias voltage for each subsequent color by employing the first nonimage potential and the nonimage potential for the subsequent color.

2. The method of claim 1 wherein the primary transfer member is a primary transfer roller.

3. The method of claim 2,
wherein the primary transfer roller is rotated only twice during pre-rotation, and
wherein said proper transfer bias voltages for the first and subsequent colors are determined within no more than said two rotations.

4. The method of claim 2 wherein the primary transfer roller only makes a number of rotations during pre-rotation, and

wherein said number of rotations is determined by the number of predetermined voltages applied to the primary transfer roller.

5. The method of claim 2 wherein said step of determining a proper transfer bias voltage for each subsequent color excludes applying the exposure bias voltage

for that subsequent color to the primary transfer roller.

6. An image forming apparatus comprising:
 - electrifying means for electrifying an image carrier;
 - exposure means for forming an electrostatic latent image by exposing the electrified image carrier;
 - developing means for developing the electrostatic latent image on the image carrier with toner, the developing means having a plurality of developing devices each having toner of a mutually different color;
 - transfer means that, in a transfer portion, electrostatically transfers toner images of different colors that are sequentially formed on the image carrier, to a transfer medium, with one color toner image superimposed on another, the transfer means comprising a transfer member for causing the transfer medium to make contact with the image carrier, and voltage applying means for applying a voltage to the transfer member;
 - current detecting means for detecting the value of a current flowing when the voltage application by the voltage applying means is performed; and
 - control means for determining, at a time except during a transfer operation, a value of a transfer voltage to be applied to the transfer member during the transfer operation, based on the detection results obtained when a current

detecting operations by the current detecting means were performed,

wherein, based on a first detection result obtained when the current detecting operation was performed, the control means determines a first transfer voltage value to be obtained when the toner image of a first color is transferred to the transfer medium, when a non-image portion at the time during the formation of an image of a first color in the image carrier passes through the transfer portion before the toner image of the first color is transferred to the transfer medium; and

wherein, based on the first detection result, a potential value of a non-image portion at the time during the formation of an image of each of a second and later colors in the image carrier, and a potential value of the non-image portion at the time during the formation of an image of the first color in the image carrier, the control means determines each transfer voltage value to be obtained when the toner image of a respective one of the second and later colors is transferred to the transfer medium.

7. The image forming apparatus according to Claim 6, wherein:

the exposure means exposes a non-image portion;
the developing means develops an unexposed portion on

the image carrier with toner, the unexposed portion being not subjected to an exposure by the exposure means;

the non-image portion at the time during the formation of an image of the first color in the image carrier is an exposed portion at the time during the formation of an image of the first color; and

the non-image portion at the time during the formation of an image of each of second and later colors in the image carrier is an exposed portion at the time during the formation of an image of a respective one of the second and later colors.

8. The image forming apparatus according to Claim 6, wherein the control means performs the current detecting operation by detecting respective corresponding current values at the time when a plurality of predetermined voltages is applied.

9. The image forming apparatus according to Claim 6, further comprising temperature and humidity sensing means for sensing temperature and humidity, and wherein the potential of a non-image portion during image formation is determined based on temperature and humidity information obtained by the temperature and humidity sensing means.

10. The image forming apparatus according to Claim 6, wherein the potential of a non-image portion during image formation can be set for each toner color.

11. The image forming apparatus according to Claim 6, wherein the transfer medium is an intermediate transfer member.

12. The image forming apparatus according to Claim 6, wherein the transfer medium is a transfer material.

13. The image forming apparatus according to Claim 10, further comprising density sensing means for sensing the density of a toner image formed on the image carrier, wherein the toner image of each color formed under a predetermined image forming condition is sensed by the density sensing means, and wherein the potential of the non-image portion at the time during the formation of an image of each color in the image carrier is determined in accordance with the sensing result by the density sensing means.

14. A method for determining a proper transfer bias for each one of a plurality of colors to produce electrostatic or electrographic color images, the method

comprising:

providing an image carrier to carry color toner images;
determining a plurality of nonimage potentials for a
nonimage region of the image carrier, wherein each nonimage
potential corresponds to a respective one of the plurality
of colors;

for said first color, determining a proper transfer
bias voltage by,

applying a first nonimage potential corresponding
to the first color to the photoconductive drum, and

applying three predetermined voltages to the
primary transfer member,

obtaining three currents corresponding to said
three predetermined voltages during rotation of said primary
transfer member, and

using the three currents and predetermined voltages
to determine the proper transfer bias voltage for the first
color; and

for all subsequent colors, determining a proper
transfer bias voltage for each subsequent color by employing
the first nonimage potential and the nonimage potential for
the subsequent color,

wherein said proper transfer bias voltages for the
first and subsequent colors are determined within no more
than three rotations of the primary transfer member.

15. The method of claim 14 wherein the primary transfer member is a primary transfer roller.